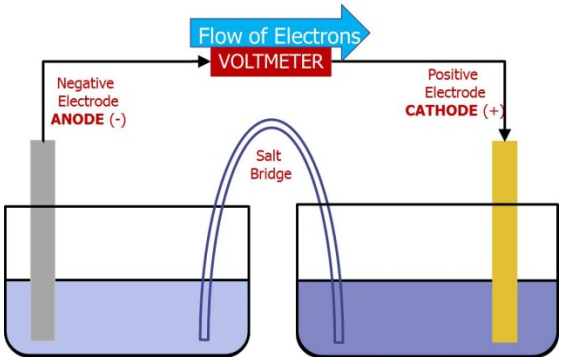
T09D05 – Voltaic Cell Lab

Measuring the Potential Difference generated while manipulating several variables

Aim:

The purpose of this experiment is to construct several voltaic (electrochemical) cells and to measure the potential difference between the electrodes, noting the polarity (+ vs -).



Materials:

You have available to you, the following materials:

- Electrodes (Cu, Zn, Fe, Mg)
- Solutions (0.1M, 0.5M, 1.0M $CuSO_4$, $CuCl_2$, $ZnSO_4$, $ZnCl_2$, $FeSO_4$, $FeCl_2$, $MgSO_4$, $MgCl_2$)
- Concentrated KI or KNO_3 for the Salt Bridge
- Beakers, salt bridge tube, cotton balls, voltmeter, alligator clamps
- Hot plate

Introduction:

When you measure the potential difference between the electrodes of each cell, the polarity of each electrode is indicated by the positive sign and negative sign on the voltmeter (or red and black terminals respectively). Thus, you can determine at which electrode electrons are needed and at which electrode electrons are produced. From this, you can work out the direction in which the overall reaction proceeds.

Procedure:

1. Choose a single variable to manipulate (nature of electrode, concentration of solution, nature of solution, or temperature of the solutions).
2. Set up your first half-cell, and then your second half-cell (Be sure to use smaller beakers and just enough solution for your experiment – no need to waste)
3. Complete the circuit using the salt bridge, and wires through the voltmeter.
4. Make note of the voltage, if it's negative, switch the wires.
5. Repeat, using resources available for that independent variable. Depending on your set-up, you may need to make a new salt bridge every few trials.
6. When you have finished your first set, attempt to test another of the three variables
7. Record all necessary results and provide diagrams, equations, calculations, tables, and explanations where appropriate

Write-up:

<u>DCP and CE</u>

You are to write up the DCP and CE for this lab. For this reason you will need to account for error and uncertainty as best you can throughout the lab.

Due Date:

This lab will be due the Friday we return from Winter Vacation. I strongly recommend that you do a majority of the work in the next week (especially if we have Friday off!!).